

Two New Species of Cestodes Belonging to the Genus *Vampirolepis* (Cyclophyllidea: Hymenolepididae) from Cave Bats of Taiwan

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ABSTRACT — *Vampirolepis taiwanensis* sp. n. and *Vampirolepis macrostrobiloides* sp. n. are described from the bent-winged bat, *Miniopterus schreibersii fuliginosus*, and the leaf-nosed bat, *Hipposideros armiger terasensis*, of Taiwan, respectively. *V. taiwanensis* sp. n. most closely resembles *V. isensis* Sawada, 1966 and *V. ogaensis* Sawada, 1974, but differs from *V. isensis* in smaller rostellar hooks and triangularly arranged testes and from *V. ogaensis* in fewer rostellar hooks and triangularly arranged testes. *V. macrostrobiloides* sp. n. is different from all other species in the genus so far recorded from bats in having macrostrobila, larger eggs, larger onchospheres and larger embryonic hooks.

INTRODUCTION

To date, the endoparasites fauna of cave bats on Taiwan has been unknown for the most part. The present study was carried out to clarify the systematic position of chiropteran cestodes on Taiwan. In December 1974 and November 1981, 59 bats were collected from several raceways, a stalactite grotto, a tunnel and a house, and examined for cestodes. The bats were captured alive by hand and autopsied immediately at the collecting sites. Their alimentary canals were cut open as soon as possible, fixed in Carnoy's fluid (three parts of 100% ethyl alcohol plus one part of acetic acid) and brought to Japan. After the alimentary canals were soaked in 45% acetic acid for 30 minutes for expanding, they were stored in 70% alcohol. Cestodes, obtained from the alcohol-preserved alimentary canals, were stained with Heidenhain's iron hematoxylin, dehydrated in alcohol, cleared in xylene, and mounted in Canada balsam. Measurements are given in millimeters.

RESULTS

The data on the bats examined and the cestodes found are given in Tables 1 and 2, and the stations at which the bat collections were made are shown on the maps (Figs. 1 and 2).

The bats, *Rhinolophus monoceros*, *Myotis adversus taiwanensis* and *My. mystacinus latirostris*, were infected with no cestodes.

Vampirolepis taiwanensis sp. n.

(Figs. 3-6)

Nine bats, *Miniopterus schreibersii fuliginosus*, were obtained from two raceways in Taichung and Nantou Countries in December 1974, and were examined for cestodes. Three of them were found infected with three specimens of this cestode. In November 10, 1981, eleven bats, *M. s. fuliginosus*, were collected from a raceway in Nantou Country. Four of them were found infected with nine specimens of the cestode.

Description (based on three mature specimens): Mature worms 12-31 long by 0.8-1.4 wide. Metamerism distinct, craspedote, margins slightly serrate. All proglottides wider than long. Genital pores unilateral, located a little posterior to midline.

TABLE 1. Cestodes found in cave bats collected on Taiwan in December 1974

Serial No. of locality in Fig. 1	Locality	Date	Bat species	Number of bats			Cestode species
				ex- amined	infected	%	
1	Raceway Shinchung-township, Taichung Country	8 Dec.	<i>Miniopterus schreibersii fuliginosus</i>	2	1	50	<i>Vampirolepis taiwanensis</i> n. sp.
2	Raceway Kouhsing-township, Nantou Country	12 Dec.	<i>M. s. fuliginosus</i>	7	2	29	<i>V. taiwanensis</i>
			<i>Myotis mystacinus latirostris</i>	1	0	0	
			<i>My. adversus taiwanensis</i>	1	0	0	
3	Raceway Puli-township, Nantou Country	12 Dec.	<i>Rhinolophus monoceros</i>	3	0	0	
4	Stalactite grotto Kenting, Pingtung Country	20 Dec.	<i>M. s. fuliginosus</i>	2	0	0	
			<i>R. monoceros</i>	1	0	0	
5	House Haulien-city, Haulien Country	23 Dec.	<i>Pipistrellus abramus</i>	5	0	0	

TABLE 2. Cestodes found in cave bats collected on Taiwan in November 1981

Serial No. of locality in Fig. 2	Locality	Date	Bat species	Number of bats			Cestode species
				ex- amined	in- fected	%	
1	Raceway Kouhsing-township, Nantou Country	10 Nov.	<i>Miniopterus schreibersii fuliginosus</i>	11	4	36	<i>Vampirolepis taiwanensis</i>
2	Raceway Puli-township, Nantou Country	10 Nov.	<i>Rhinolophus monoceros</i>	12	0	0	
			<i>Myotis adversus taiwanensis</i>	2	0	0	
			<i>My. mystacinus latirostris</i>	1	0	0	
3	Tunnel Puli-township, Nantou Country	11 Nov.	<i>Hipposideros armiger teraensis</i>	4	1	25	<i>V. macrostrobiloides</i> n. sp.
			<i>R. monoceros</i>	2	0	0	
			<i>M. s. fuliginosus</i>	1	0	0	
4	Raceway Kouhsing-township, Nantou Country	11 Nov.	<i>R. monoceros</i>	2	0	0	
			<i>M. m. latirostris</i>	2	0	0	

of proglottid margin. Scolex 0.245–0.350 long by 0.245–0.301 wide, not sharply demarcated from strobila. Rostellum 0.084 long by 0.063–0.077 wide, armed with a single circle of 22–24 hooks. Hooks measuring 0.018–0.021 long; hook handle

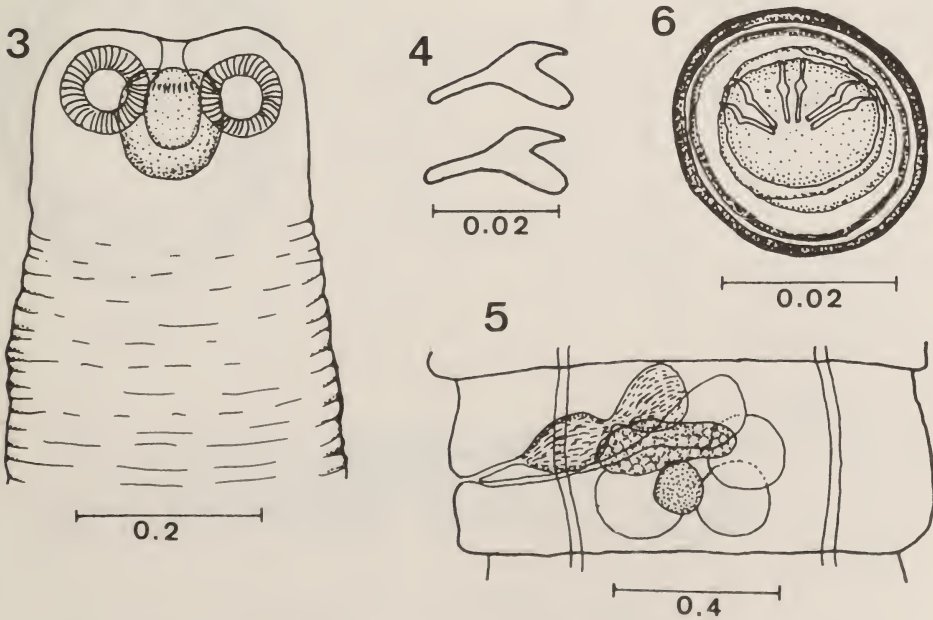
long; guard bluntly rounded at its end, slightly shorter than or equal to blade. Rostellar sac 0.098 by 0.063, muscular, pyriform, extending posterior to suckers. Suckers 0.070–0.084 long by 0.091–0.112, round to oval. Neck absent.



FIG. 1. Sketch map showing the collecting sites of the bats on Taiwan in December 1974. For the locality numbers, see Table 1.



FIG. 2. Sketch map showing the collecting sites of the bats at Nantou Country in November 1981. For the locality numbers, see Table 2.



FIGS. 3-6. *Vampirolepis taiwanensis* sp. n.
3: Scolex. 4: Rostellar hooks. 5: Mature proglottid. 6: Egg. Scales in mm.

Testes three per proglottid, ovoid, 0.055–0.069 by 0.065–0.083, arranged in a form of triangle, one poral and two aporal. External seminal vesicle oval, 0.053–0.070 by 0.018, directly dorsal to seminal receptacle, situated in anterior half of proglottid. Internal seminal vesicle gradually enlarging to fill proximal portion of cirrus sac. Cirrus sac 0.140 by 0.014–0.018, extending anterolaterally beyond osmoregulatory canals. Vagina initially posterior to cirrus sac, passing behind cirrus sac, gradually expanding into voluminous seminal receptacle measuring 0.028 by 0.014. Ovary 0.140–0.152 wide, medial, transversely elongated, in middle or in anterior half of proglottid. Vitelline gland, round, 0.021–0.028 by 0.021, just posterior to ovary. Uterus saccular, occupying area between osmoregulatory canals in gravid proglottides. Eggs spherical, 0.032 by 0.035–0.039, surrounded by four envelopes; outermost chorion thick, with rough surface. Onchospheres spherical, 0.028 by 0.021–0.025;

embryonic hooks 0.014 long.

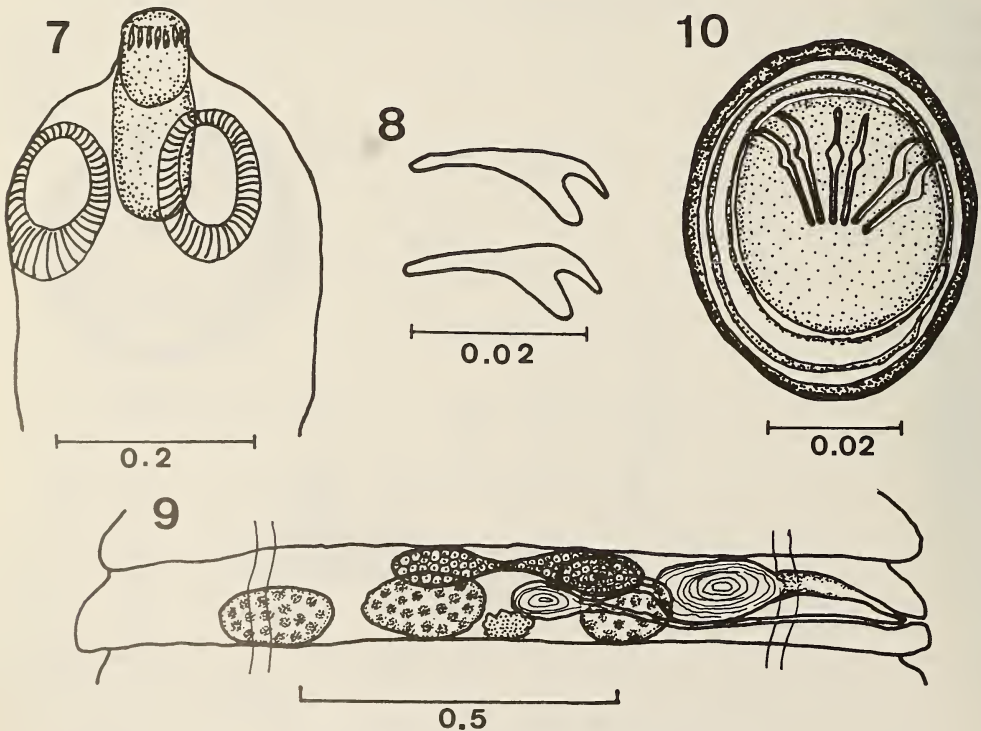
Host: *Miniopterus schreibersii fuliginosus*.

Habitat: Small intestine.

Localities and dates: Shinchung-township, Taichung Country, December 8, 1974; and Kouhsing, Nantou Country, December 12, 1974 and November 10, 1981.

Type depository: Biological Laboratory, Nara University of Education, Nara, Japan.

Remarks: *Vampirolepis taiwanensis* sp. n. most closely resembles *V. isensis* Sawada, 1966 [1], in the number of rostellar hooks and *V. ogaensis* Sawada, 1974 [2], in the length of rostellar hooks. *V. taiwanensis* can be separated from *V. isensis* in that it possesses smaller rostellar hooks (0.018–0.021 vs. 0.032) and in the arrangement of the testes (triangular distribution vs. transverse row). It differs from *V. ogaensis* in the number of rostellar hooks (22–24 vs. 30) and in the arrangement of the



FIGS. 7–10. *Vampirolepis macrostrobiloides* sp. n.

7: Scolex. 8: Rostellar hooks. 9: Mature proglottid. 10: Egg. Scales in mm.

testes (triangular position vs. transverse row).

Vampirolepis macrostrobiloides sp. n.

(Figs. 7-10)

Four bats, *Hipposideros armiger terasensis*, were collected in a tunnel at Puli-township, Nantou Country in November 11, 1981. One of them was found infected with a single large specimen of this cestode.

Description (based on one mature specimen): Length of strobila 152, maximum width 3.8. Strobila margins serrate. All proglottides wider than long. Scolex somewhat round when the rostellum is invaginated, 0.245 long by 0.301 wide, not sharply demarcated from neck. Rostellum 0.077 in diameter, retractable into elongated rostellar sac measuring 0.161 by 0.119, armed with a single row of 18 hooks measuring 0.025 long. Hook handle long; guard bluntly round at its end, longer than blade. Unarmed suckers oval, 0.119 by 0.105. Neck region behind scolex 1.2 long by 0.025 wide. Genital pores unilateral, located a little posterior to middle.

Testes three in number, subspherical, 0.166-0.180 by 0.083, situated in posterior field of proglottid, arranged in a transverse row, one poral and two aporal. Aporal testis usually elongate, located between dorsal and ventral osmoregulatory canals. Cirrus sac 0.207 by 0.042, occupied by internal seminal vesicle measuring 0.124-0.138 by 0.042. External seminal vesicle oval, 0.207-0.290 by 0.124. Ovary transversely elongated and bilobed in mature proglottid, 0.415-0.443 by 0.069-0.083. Vitelline gland small, lobed or oval, 0.124 by 0.041-0.069, situated near midline in space between first and second testes in posterior field of proglottid. Vagina opening in genital atrium, extending along ventral surface of cirrus sac, increasing gradually in diameter, forming large seminal receptacle. Seminal receptacle more or less globular, 0.152-0.208 by 0.055-0.083. Uterus arising directly from ovarian lobes as a lobe sac, gradually enlarging, filling entire whole part of proglottid.

Eggs subspherical, 0.053-0.056 by 0.046, surrounded by four envelopes; outermost chorion thick, with smooth surface. Onchospheres spherical, 0.032-0.035 by 0.035-0.039; embryonic hooks 0.018 long.

Host: *Hipposideros armiger terasensis*.

Habitat: Small intestine.

Locality and date: Puli-township, Nantou Country; November 11, 1981.

Type depository: Biological Laboratory, Nara University of Education, Nara, Japan.

Remarks: The present new species is separated from all the known species of *Vampirolepis* which have so far been recorded from the bats [1-5] by the larger size of the strobila, eggs and onchospheres and by possessing longer embryonic hooks.

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